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Excited Boson Stars

Abstract

Axisymmetric rotating radially excited boson stars are analyzed. For several fixed parameter sets, the full sets of solutions are obtained. In contrast to the nodeless boson stars, the radially excited sets of solutions do not exhibit a spiraling behavior. Instead they form a loop, when the boson frequency is varied from its maximal value given by the boson mass to a minimal value and back. Thus for all allowed boundary data of the scalar field at the origin, there are two distinct solutions, except for the endpoints. While one endpoint corresponds to the trivial solution, the other one represents the most compact solution. The energy density and the pressures of the solutions are analyzed. A decomposition of the scalar field into spherical harmonics is performed, and stability considerations are presented.